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Signal Evolution Through Clustering of fMRI Data

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ABSTRACT

The human brain is a large, complex organ comprised of billions of neurons and hundreds of trillions of connections, which makes the advanced cognitive functions possible. However, with various techniques including magnetic resonance imaging and electroencephalogram, the complexities in the brain are still largely unknown. In fact, the signals from these technologies are still under heavy debate in regard to their true meanings. In order to explore this problem, k-mean clustering was utilized as a method to evaluate functional magnetic resonance imaging data of subjects that were given repeated visual stimulus (>100 times). It was found (after averaging 100 trials) that subjects had robust signals throughout the brain, which was not limited to just the visual cortex. In this project, clustering methods were applied on these scans to further explore the evolutional features of these signals invoked by visual stimulation. It was found from preliminary results that the evolution of these signals taken by subtracting voxels to adjacent voxels appears may be attributed to 5 different shapes. These shapes ultimately are similar to the base signals found in the gray matter of the brain. This could signify that there is an underlying meaning behind these functional magnetic resonance imaging signals which could have been overlooked.

KEYWORDS

fMRI, activation extent, clustering